EXD.

STRAWBERRY CULTURE IN TENNESSEE, KENTUCKY, AND WEST VIRGINIA

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STRAWBERRIES are more widely grown than any other kind of fruit. Centers of large commercial production are found in many different regions throughout the country. From these different centers fruit ripening in sequence is supplied continuously throughout a period of more than six months of each year.

Such centers of production are located in the States named in the title of this bulletin, especially in Tennessee and Kentucky, where a number of large strawberry-growing sections are found. Throughout the month of May and the first part of June these States supply large quantities of berries to the general markets. There are no extensive commercial strawberry interests in West Virginia, though the fruit is grown in most portions of that State.

Both intensive and extensive methods of culture are followed by the growers in Tennessee and Kentucky, and the details of practice vary widely. In some sections yields far in excess of those obtained in others are commonly secured.

The practice with regard to mulching is an example of the difference in methods of culture. Some growers burn their straw stacks and do not mulch their strawberries; others grow wheat, mainly that they may have the straw available for mulching; while still others buy straw in large quantities for this purpose.

This bulletin discusses the different cultural methods used in different sections and points out those which have been demonstrated by experience to be the most efficient. It is of interest to strawberry growers not only in the States mentioned in its title but also in other parts of the South and Middle West, especially in Missouri, Arkansas, and Kansas, where the conditions are similar to those in the strawberry-growing regions of Tennessee, Kentucky, and West Virginia.

STRAWBERRY CULTURE IN TENNESSEE, KENTUCKY, AND WEST VIRGINIA.

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METHODS OF CULTURE.

STRAWBERRY culture is one of the most important enterprises on farms in many parts of Tennessee, Kentucky, and West Virginia, but the methods of growing the crop differ greatly in the various sections. Some of these differences are based on soil conditions and others on market requirements, but perhaps the most important factor in determining the method used is the knowledge which growers possess of the practices followed in other localities. The purpose of this bulletin is to give concise information on the best practices for the different sections of the States mentioned.

Two methods of strawberry culture are used by growers in this region, intensive and extensive. When the crop is sold in the local markets it is raised usually by market gardeners. When destined for the general markets, however, the berries are grown as a field crop and somewhat different methods are employed. By far the larger part of the product is grown by farmers for the general markets.

Market gardeners for the most part cultivate their fields much more thoroughly than do those who raise strawberries as a field crop. In some sections, however, intensive methods have been adopted by farmers who ship to general markets, and these growers have been especially successful. Although the average number of acres grown by those using intensive methods may not equal the acreage of those

using extensive methods, the thorough culture of a few acres has been found more profitable than less intensive methods on a larger area. Furthermore, better berries can be produced under intensive methods, and the markets are continually demanding better berries. For these reasons the intensive methods which should be adopted generally are described here.

EXTENT OF STRAWBERRY SHIPMENTS FROM TENNESSEE AND KENTUCKY.

The extent of the commercial shipment of strawberries from Tennessee and Kentucky in 1914 and 1915 is shown in Table I.

TABLE I.—*Strawberry shipments from Tennessee and Kentucky in 1914*[1] *and 1915*,[2] *showing the number of carloads from each important shipping point.*

Shipping point.	Carloads shipped.		Shipping point.	Carloads shipped.	
	1914	1915		1914	1915
TENNESSEE.			TENNESSEE—continued.		
East Tennessee section:			West Tennessee section—Con.		
Spring City	110.0	140	Gadsden	35	33
Dayton	109	155	Halls	27	17
Evensville	109	142	Trezevant	25	16
Bakewell	36	34	Bells	23	29
Knoxville	30	32	Greenfield	18	12
Chattanooga	24	19	Rutherford	13.5	.....
Sale Creek	15.5	37	Milan	13	12
Soddy	12	.....	Dresden	10	12
East Chattanooga	8	.....	Henderson	5	.....
Harriman	8	.....	Henning	4	.....
Rockwood	6	3	Trenton	4	8
Roddy	5	.....	Gibson	2	6
Lancing	2.5	10	Fruitland	.5	.....
Athens	2	.....	Grand Junction	.....	15
Hixson	2	.....	Obion	.....	6
Cleveland	1	.....			
Coulterville	1	.....	Total	1,012.5	827
Sheffield	.....	24			
Boyce	.....	16	Middle Tennessee section:		
Graysville	.....	4	Nashville	6	4
Rathburn	.....	4	Portland	.....	8
Total	481	620	Total	6	12
West Tennessee section:			State total	1,493.5	1,459
Humboldt	267	252			
Sharon	83	56	KENTUCKY.		
Curve	71.5	39			
Ripley	70	36	Bowling Green	.75	156
Gates	66	47	Middletown	6	.....
Dyer	64	63	Kings Mountain	2	.....
Kenton	64	46	Louisville	1	33
Medina	56	71	Paducah	.5	4
Jackson	52	45			
Bradford	39	6	State total	84.5	193

[1] See U. S. Dept. Agr. Bul. 237, "Strawberry Supply and Distribution in 1914."
[2] See U. S. Dept. Agr. Bul. 477, "Marketing and Distribution of Strawberries in 1915."

The greater part of the Tennessee crop is sent to northern markets, about 1,500 cars being shipped in an ordinary season. In Kentucky a much smaller percentage is shipped, most of the crop being consumed locally, while in West Virginia the entire crop is sold in the local markets.

SELECTION OF A SUITABLE LOCATION FOR GROWING STRAWBERRIES.

The principal factors governing the selection of a location for a strawberry field are cheap and adequate facilities for delivering the fruit to the market center. Table I shows the location of the principal shipping points in Tennessee and Kentucky and indicates the importance of good transportation facilities. It will be noticed that nearly all of these points are located on the main lines of railroads running north and south, where the most direct means of shipment to northern markets can be secured.

Good facilities for shipping fresh strawberries to distant markets include not only an adequate fast railroad service but suitable refrigerator-car facilities. Fruit must be produced in sufficient quantities to make possible full-car shipments; otherwise the berries will have to be shipped by express, the rates for such transportation often representing so large a proportion of the profits as to be practically prohibitive. Good roads from the strawberry field or packing house to the shipping station are also essential.

In selecting a location in which to grow strawberries for a local market the condition of the wagon roads and the present supply of that market are important matters for consideration. It is obvious that a grower who wishes to produce berries for a local trade should select a place near a market that is not already well supplied. A desirable location for growing strawberries for this trade also implies good roads. When jolted over rough roads strawberries are likely to be so badly bruised that they will make a poor appearance when displayed for sale and will not keep well.

SITE FOR A STRAWBERRY FIELD.

In selecting a site for a strawberry field in Tennessee, Kentucky, or West Virginia, the principal factors to be considered are soil, exposure, and slope.

SOIL.

The type of soil, whether it be sand, silt, or clay, is not so important as that it should be well supplied with humus. Thus, in west Tennessee, where the Klondike is the principal variety, the soil is, for the most part, a silt loam, sometimes grading into a sandy loam. In other parts of Tennessee and in the States farther south, the Klondike is grown successfully on almost pure sand as well as on sandy loams, silt loams, and heavy clay loams, and it seems to be well adapted to all these soils. The Aroma appears to thrive best on silt loams, such as are found about Bowling Green, Ky., and the Gandy on clay loams; yet either variety is produced successfully on a wide range of soils, provided they contain a good supply of humus.

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FIG. 1.—A field of Klondike strawberries in which the rows have been planted on ridges parallel to the contour lines to prevent the washing of the soil.

A particular type of soil is not so important a consideration in choosing a site as the supply of humus in the soil. In east Tennessee a large part of the strawberries are grown on a poor, gravelly soil. Recently cleared woodland is preferred by growers in this section, because it contains much humus, is free from weeds, and is fairly fertile. The humus supply in such soils diminishes rapidly, however, and after a few years the yield of berries becomes small, so that more woodland must be cleared for strawberry growing. This is not, of course, a permanent system of agriculture, as there is always a limit to the area of woodland that can be cleared, but it indicates the importance of humus.

In all other sections of the States of Tennessee, Kentucky, and West Virginia the humus supply is of great importance. Strawberry plantations are fruited for several years, until the fields have become unprofitable. Then other crops are raised on such fields and strawberries can not be grown again profitably until the humus supply has been renewed.

EXPOSURE.

By the exposure of a strawberry plantation is meant the direction in which the field slopes. It is well known that plant growth starts earlier in the spring on a southern exposure than on a northern one. Likewise, the berries in a field sloping toward the south ripen first. Only in east Tennessee, however, is the selection of a site with a particular exposure considered, and all growers there do not agree as to its importance. In that section the berries first marketed

usually bring the highest price, and many growers prefer to use a field with a southern exposure. Others, however, do not consider the exposure of much importance, as the supply of humus and moisture is retained better on fields with northern exposures, and the larger yields of such fields are thought to balance the earlier maturity of berries grown on southern slopes.

SLOPE.

In the States specified in this bulletin the steepness of the slope is an important factor in the selection of a site for a strawberry field. The heavy precipitation, together with a deficient supply of humus, causes the soils to wash very badly, especially on steep slopes. In east Tennessee and in West Virginia, where strawberries are grown usually on steep hillsides, much of the washing is prevented by growing the plants in rows which follow the contour of the hill, as shown in figure 1. In other sections level or nearly level land is generally used, and the danger of washing is not so serious. Figure 2 also shows rows which follow the contour of the field.

Another factor of importance in the hilly sections is the smoothness of the land. Cultivation and other operations on an irregular slope are much more expensive than on a long, even slope, such as is shown in figure 2. An irregular slope should be selected only when its other features are very favorable.

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FIG. 2.—A field of Gandy strawberries at Parkersburg, W. Va., trained to wide matted rows and well mulched. The rows follow the contour of the field.

PREPARATION OF THE SOIL.

Besides plowing and harrowing, which enter into the preparation of the soil for an intensive crop, several other important matters should be considered in preparing a field for strawberries. These are freeing the soil from white grubs and weeds, preparing a good supply of humus, and making ridges parallel to the contour in sections where they are needed.

WHITE GRUBS.[1]

White grubs are abundant in the States of Tennessee, Kentucky, and West Virginia in land which has been in sod for some time. When such a field is set to strawberries the grubs feed on the roots of the plants and kill them. In order that there may be a minimum of loss from these insects the field which is to be set to strawberries should not be in sod for two years preceding the planting. Any crop which is tilled throughout the summer may be grown during this period.

WEEDS.

Cultivation throughout the season preceding that in which the strawberries are set will help to free the soil from weeds and clovers, which it is so difficult to keep out of strawberry fields. Such cultivation must be thorough and continued until late in the autumn to be effective.

HUMUS.

Because of the need of humus in most soils, growers, previous to setting strawberries, should either raise a cultivated crop which is heavily fertilized with stable manure or grow a green-manure crop, such as cowpeas or rye, which can be plowed under. On land properly supplied with humus in either of the ways suggested, several crops of strawberries may be grown before the field becomes unprofitable.

In east Tennessee, when land recently cleared is set to strawberries, the soil contains a good supply of humus and is generally free from weeds and white grubs. Such land is not usually planted with another crop before the strawberries are set. Some growers, however, raise corn or some other cultivated crop one or more years in order to break up the clods and get the soil in better physical condition.

In the section about Bowling Green, Ky., growers consider it profitable to apply about 10 tons of stable manure per acre to a field during the year preceding that in which the strawberry plants are set. The land is then plowed and kept fallow all summer. When this practice is followed the weed seeds germinate, so that there will be less trouble from them after the berries are planted. The stable manure

[1] For further information on these insects, see Davis, John J., Common white grubs, U. S. Department of Agriculture, Farmers' Bulletin 543, 20 p., 12 fig., 1913.

furnishes humus to the soil, and the continual harrowing makes a splendid bed in which to set the plants the following spring.

CONTOURS.

The land should be plowed and harrowed as for other crops requiring a fine seed bed. In addition, in all sections of the States discussed in this bulletin it is essential that the strawberry rows should conform to the contours of the fields, as shown in figures 1 and 2.

Such methods of plowing, harrowing, and ridging the land should be used as will allow the rows to run with the contour of the field. Fields badly washed because the rows do not follow the contours are frequently seen in the region mentioned.

On hilly land in east Tennessee and sometimes in other sections, slight ridges, as shown in figure 1, should be made to assist in preventing erosion.

FERTILIZERS.

The use of fertilizers on strawberry fields is governed by the same principles that apply to their use for other crops. The kinds and quantities of plant food that can be used profitably depend upon the physical condition of the soil and the plant foods already available in it. As these vary, the needs in any particular case can be determined only by applying the different plant foods separately and in varying combinations to different parts of the field and noting the results

Soil surveys and bulletins on the soils of Tennessee, Kentucky, and West Virginia and the elements of plant foods found in them indicate that of the soil types commonly used for strawberries none is lacking in potassium, while all are deficient in phosphorus; also, that when the soil has been properly prepared for strawberries and contains a good supply of humus there is seldom a deficiency of nitrogen, for the humus contains large amounts of this plant food. Neither is lime needed ordinarily, for strawberries grow best in an acid soil, and recent experiments in Pennsylvania have shown that lime is actually harmful to the growth of these plants.

Potassium, nitrogen, and lime, therefore, can not be recommended for use on the soils on which strawberries are commonly grown in the States discussed in these pages. Most growers, however, will need to use some phosphorus to secure the best results. From 200 to 400 pounds per acre of acid phosphate or steamed bone meal will usually be beneficial. In some cases double this quantity will be profitable, while in others less should be used. Each grower should make applications of different amounts on small plats and compare the yield from them with a similar plat on which no fertilizer has been used. In this way it will be possible to determine just how much will be profitable.

The best time for the application of the acid phosphate or bone meal should be determined by each grower for his own conditions. It is suggested, however, that the first application be made at the time of planting and that a similar application be made each year immediately after the old field has been cleaned out following the harvesting of the fruit.

Stable manure should not be applied, because it usually contains weed and grass seeds and also too much nitrogen. Experiments have shown that in regions similar to those in the States here discussed the use of stable manure on the field at any time after the plants are set seems to cause excessive plant growth, to reduce the yield, and to cause the berries to wilt during droughts at picking time. Stable manure may be used to advantage on other crops before the land is set to strawberries and is a very desirable means of supplying humus.

PLANTING.

TIME OF PLANTING.

The time of planting strawberries depends chiefly on a plentiful supply of moisture in the soil. In the States mentioned in this bulletin such a condition is most often present very early in the spring, and the plants should be set at that time. If they are set immediately after the ground becomes fit to work a large proportion usually live. After this the atmosphere is warmer and the moisture supply usually is not so good, while the amount needed is greater.

The date of setting strawberries varies with the section. In Tennessee and southern Kentucky the work is usually done about the last of February and through the month of March. In northern Kentucky and West Virginia the plants are set in March and April. The setting should be done within the first few days of spring after conditions have become favorable, as the percentage of plants that live when set after this period is usually much smaller and grows less the later they are set.

CARE OF PLANTS.

Plants usually are received from the nurseries tied in bundles of 25 each, the bundles being packed in damp moss or other suitable material to prevent them from becoming dry. They should have bright, fresh, large root systems and relatively small tops. Figure 3 shows three bundles of such plants. If the plants can not be set in the field immediately, the packages should be opened and the plants in the bundles separated. The plants should then be heeled in; that is, placed in a shallow trench and so covered with moist soil that the root system of each plant will come in contact with the soil, while the crown remains above ground.

PLANTING DISTANCES.

The distance at which the plants are set in the row and the space between the rows vary with the steepness of the slope, the variety used, and the preference of the grower. Where the ground is very steep the rows should be at least 4 feet apart. Under most other conditions they are set 3½ feet apart.

Where care is given to the setting and there is little danger of loss, a distance of 3 feet apart in the row is to be preferred. If, however, there is danger of some of the plants being killed by white grubs or cutworms or by dry weather, it is better to set them about 18 inches apart in the row. This is perhaps the most common practice in the States covered by this bulletin. By autumn, if conditions for growth have been favorable, such a row will become a solid mat of plants.

The number of plants required per acre when set 18 inches apart in rows 3½ feet apart is about 8,300; when the plants are 3 feet apart in rows 3½ feet apart, 4,150; and when the plants are 3 feet apart in rows 4 feet apart, 3,630.

SETTING THE PLANTS.

Practically all the setting is done by hand, one man dropping for two men to set. Those who drop the plants should carry a small number at a time in a basket or carrier and never be far ahead of those who are setting. If the roots of a bundle of plants are wet and

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FIG. 3.—Bundles of 27 good plants of each of three varieties of strawberries, as received by growers from nurseries.

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FIG. 4.—Dropping and setting strawberry plants, showing the carrier from which the plants are dropped by the man on the right and the trowel used in setting the plants, in the hand of the man at the left.

matted together, they will not dry out readily. Figure 4 shows a method employed in a section in the South where a berry-basket carrier is used to hold the plants which are to be dropped. The supply of plants awaiting distribution should be protected from the sun and wind. Sometimes they are placed in bundles along one side of a field and covered with wet burlap.

In setting, a dibble, trowel, or spade is used to make an opening straight down into the soil. The tool used should then be forced forward and the roots of the plant inserted behind it. Then the tool is removed and the earth pressed firmly about the roots with the foot. Care should be taken that the crown of the plant is set even with the surface of the ground and neither above nor below it. Figure 5 shows a field about 2½ months after setting, in which the plants were properly set and nearly all are living.

SYSTEM OF TRAINING.

The only system of training strawberries adapted to the conditions and used commercially in the States of Tennessee, Kentucky, and West Virginia is the matted row. This system, when intelligently carried out, will yield very large crops of as perfect fruit as can be secured under any other system; and it is therefore entirely satisfactory.

The width of the matted row should vary with conditions, as may be seen from the accompanying illustration. Figure 6 shows a field having the proper width of row for general use, 18 to 20 inches. If the rows are narrower than 18 inches the yield is likely to be diminished, while if they are as wide as is shown in figure 7 the pickers can not readily avoid treading on plants and fruit. In figure 2 the rows are wider than usual, but on hillsides it is often better to have a wide row.

A factor in this system of training of as much importance as the width of the row is the proper spacing of the plants in the row. The plants in figure 7 have become too dense for their proper development. The berries in a field where the plants stand at least 6 inches apart will be larger and the yield greater than in one where the plants are closer together.

The Aroma and Klondike varieties seem to bear more freely than the Gandy in a dense row. Because of this, some growers of the Gandy prefer very narrow rows, where each plant can develop a large root system. All varieties, however, bear better if the plants are spaced at least 6 inches apart.

CARE DURING THE FIRST SUMMER.

Cultivation should begin immediately after the plants are set and during the first year should be thorough, in order to conserve moisture and to keep out the weeds. To do this, the fields should be gone over at least every week or ten days with a cultivator and several times during the season with hoes.

When the runners start to grow, the soil should be kept mellow, so that they can root readily. If drought should occur during the time the runners are forming, it is very essential that the moisture in the soil should be conserved and the soil kept mellow by frequent use of the cultivators. Figure 5 shows a field properly cared for after setting.

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FIG. 5.—Strawberry plants near Nashville, Tenn., about 2½ months after being set.

P10617HP

FIG. 6.—A field of Aroma strawberries grown under the matted-row system at Bowling Green, Ky., showing the width of row (18 to 20 inches) usually found in the States of Tennessee, Kentucky, and West Virginia. School children are picking the berries.

Cultivation should be continued until the ground freezes in the autumn. This will kill weeds and grass which otherwise would be ready to start quickly in the spring and would take part of the moisture needed by the strawberries at that time. Weeds and grass also interfere with the pollination of berries, a large percentage of nubbins and imperfect berries being found in fields where there is much weed growth. In weedy fields it is also much more difficult to pick the berries without injuring them. Many growers consider late fall cultivation one of the most important factors in the raising of strawberries, and in the region covered by this bulletin it is certainly very essential.

After setting, the young plants frequently send out flower stems which under favorable conditions may mature a few berries. The development of a crop of fruit on such fruiting stems, however, is a severe drain on plants not yet fully established in the ground. In seasons of drought during the blossoming and fruiting period a large number of plants may die. Under any conditions the plants are less vigorous and send out fewer runners than when the flower stems are removed. Because of this, many growers pick off the blossoms as they appear. This practice is more suitable for sections where intensive culture is used and is not regarded as profitable by many who grow the strawberry as a field crop. However, as methods of field culture become more intensive the removal of the blossoms should become the practice.

After the plants begin to send out runners, the width of the row is determined by the width of the strip which is kept cultivated. Thorough cultivation will prevent the runners from rooting and will turn them back toward the row. Thus, the width of the row is chiefly controlled by the use of the cultivator. The density of the plants in the row is controlled chiefly by cutting out with the hoe all plants that are not needed. If this cutting out is done at the time the surplus plants are forming, it will save much later work in thinning the plants after the runners have rooted.

MULCHING.

A mulch consists of some such material as wheat, rye, or oat straw and should be used generally by strawberry growers to conserve moisture and to keep the berries clean. It is used also in northern regions to prevent the heaving of the plants by alternate freezing and thawing. Market gardeners wish to secure the largest possible yields and returns from their acreage. They therefore mulch their fields in order to conserve moisture, keep down weeds, and prevent the berries from coming in contact with the soil. In Arkansas the average increase in the size of the crop resulting from the use of a mulch was found to be fully one-third. In addition to the greater yield, better prices can be secured, because the berries are free from grit.

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FIG. 7.—Strawberries planted on the wide matted-row system at Alexandria, Ky. These rows are so wide that careful picking is very difficult and the plants are too thick for their proper development.

FIG. 8.—Mulching a part of the strawberry field at Bowling Green, Ky., shown in figure 6.

Strawberry growers in West Virginia and Kentucky and about Knoxville, Tenn., have taken the market gardener's attitude with regard to mulching, while growers in the remainder of Tennessee for the most part grow the strawberry as a field crop. When it is raised as a field crop the growers do not often use a straw mulch, as they do not wish to give so much attention to the crop.

In Tennessee and southern Kentucky much of the farm labor is idle during the winter, when the mulch should be applied, so that the additional cost of spreading a mulch is small. Many of these farmers grow wheat, and many others could grow it to advantage, as the labor on a wheat crop does not conflict with the labor on strawberries. Another advantage to growers in many parts of the region specified is that a mulch applied during the winter protects the soil from washing for nearly half of the year. For these reasons the use of a mulch should be more general and will necessarily become so, for, as already stated, the markets are demanding better grades of berries each year. With the growth of this demand for better berries, growers not using a mulch will be unable to compete with those who do. Figure 6 shows a field of about 30 acres mulched with wheat straw.

The use of a mulch retards the ripening of the berries. This delay, however, is slight and seldom of importance.

The mulching material should be applied during the autumn or winter months. In Tennessee and southern Kentucky it usually should be put on the last of December and during January. Farther north and in West Virginia it should be supplied in the late fall months. One of the most satisfactory materials for this purpose is wheat straw. Any other straw or material which is free from seeds

and will serve as a mulch may be used. The quantity applied by different growers varies greatly. After the mulch has settled, it should be from 1½ to 2 inches deep. The fields shown in figures 2 and 6 have a heavier mulch than the average, but one which the owners of these fields have found profitable.

The straw is scattered over the fields so that part falls on the plants, but more of it between the rows. Figures 8 and 9 show the mulch being applied. In the spring the plants will grow up through the straw, and the berries will thus be kept clean. If the mulch on the rows is very heavy it may be necessary to go over the fields at the time growth starts and remove a little of it here and there. Sometimes weeds and grass start up in the spring through the mulch, but if pulled when small and before the fruit has begun to ripen the crop will not be injured. Little trouble will be experienced from this source, however, if late autumn cultivation is practiced.

RENEWING THE PLANTATION.

In most parts of the States of Tennessee, Kentucky, and West Virginia several crops of berries should be harvested from a field before it is abandoned. Usually it is cheaper to renew the old plantation and care for it until the next fruiting season than to set a new field and tend it up to the time a crop may be secured. After the first crop is taken from a field it is too late in the season to use the same ground for most other crops. It is often necessary, therefore, to charge against one crop of berries the rent of the land for two years. If the field has been properly renewed, the second crop should be as large as the first, and in some cases where the field has been skillfully managed the third or fourth crop has been the largest of any.

FIG. 9.—The strawberry field at Bowling Green, Ky., shown in figures 6 and 8, when partly mulched. The straw was thrown off the wagon in windrows and spread by hand over the rows of plants.

BURNING THE MULCH.

Where a mulch is used, it is customary, immediately after the harvest season is over, to mow the plants as close to the ground as possible, and as soon as the leaves have dried to burn the field over. Sometimes the mulch is raked on top of the rows before it is burned. All insects and diseases on the leaves will thus be destroyed, and the mulch, which would interfere with later work, is disposed of.

> CAUTION.—Do not mow the plants or burn the mulch in a period of drought, as under such conditions there is too much danger of killing the plants. The plants should be mowed when the ground is moist, and the mulch should be burned only when the ground is moist but the leaves and mulch entirely dry.

Ideal conditions for burning are secured when the plants are mowed soon after a good rain and burned as soon as the leaves and mulch are thoroughly dry. If a light breeze is blowing, the fire will run over the rows very quickly. The crowns of the Bubach and Dunlap varieties are very tender; therefore, where these varieties are grown, the mulch and leaves should be raked between the rows before burning.

THINNING THE PLANTS.

The aim in renewing a plantation should be to obtain as far as possible a stand of 1-year-old plants from which to secure a second crop. Therefore the plants that have fruited should be thinned in order to give the runner plants a chance to start. To do this, the corresponding side of each row should be plowed up immediately after burning the mulch, or as soon as possible after harvesting if a mulch has not been used. The rows should be left as narrow as is possible and still have a continuous line of plants. They should then be thinned by the use of a hoe so as to stand about 12 inches apart.

Another method of thinning the plants is to turn on the row the furrow made by plowing up one side of it. A spike-tooth harrow with the teeth slanting backward is then run across the rows until the furrows have been leveled and the plants have been thinned to the desired stand.

The rows of plants may be moved each year if desired. To do this, after the harvest period the rows should be split lengthwise with a plow and the corresponding half of each row plowed under. Runner plants from the remaining half of each row are allowed to cover part of the space that was between two rows. The following year the remainder of the original row is plowed up and the row

is made to run in what was the space between the rows during the two previous years.

The cultural treatment of a renovated field is the same as for a newly set field.

SPECIAL PRACTICES.

In some parts of Tennessee where the strawberry is treated as a field crop nothing except the mowing of weeds is done to the plantation after the harvesting season until the next crop is ready to be picked. The average yield for the second crop under such circumstances is small. Occasionally the conditions may be very favorable and this practice may prove profitable. More frequently, however, the growth of weeds is so rapid that the strawberry plants are badly crowded and bear very little fruit. Moreover, if the ground tends to bake, it may be impossible for the new plants to take root. Weeds also interfere with the proper pollination of the flowers in the spring, and in case of even a moderate drought they will compete with the strawberry plants for moisture. For these reasons the renewal of the plantation usually will be more profitable than this method of maintenance.

HARVESTING.

In all sections of the region covered by this bulletin the picking is done by mixed groups of men, women, and children. Where a grower has a large acreage, tents or buildings are often furnished, so that the pickers may stay on the place throughout the harvesting season. Sometimes families take advantage of this occasion to camp out. Other groups, as shown in the distance in figure 6, consist of school children in charge of their teachers. In west Tennessee much of the work is done by those who are later employed in cotton fields. As the fruiting season of the early varieties of strawberries usually lasts until much additional labor is needed in the cotton fields, late-ripening varieties are not considered profitable in this section.

Pickers are paid from 1 to 2 cents a quart for gathering the berries. The price varies with the section, with the grade of work done, and with the plan of management. Thus, about Bowling Green, Ky., pickers are paid 6 cents a gallon, and if they stay until the end of the season they are paid another cent for each gallon picked during the season. This system serves to hold the pickers through the latter part of the season when the berries are small and less plentiful. About Knoxville, Tenn., some growers pay the pickers doing the best work one-half cent a quart more than untrained and poor pickers. They consider that the extra pay encourages careful work and that the berries are worth more when handled by the best pickers.

The number of pickers to the acre varies greatly. Where the yields are small two pickers to the acre are sufficient. On the other

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FIG. 10.—Crates of Aroma strawberries and two types of carriers used by pickers.

hand, eight to ten are sometimes needed in the height of the season on the best fields. On a field yielding 100 crates of 24 quarts each per acre, four pickers working every day should take care of the crop.

In a field given good attention there should be very few berries that are not of the best market grade. In the field shown in figure 6 the berries were almost perfect, and no sorting after picking was necessary. Figure 10 shows carriers and crates of berries from this field. To secure crops of such fruit, however, the plants should be properly spaced in the row, the field must be free from weeds and grass, and the humus in the soil and the mulch must be sufficient to maintain an adequate supply of moisture while the berries are growing and ripening.

After raising berries of the best grade, it is necessary to pick and handle them properly in order that they may reach the market in the best condition. The field should be picked over at least every other day, and at the height of the season it will often be necessary to pick the fruit daily. No ripe berries should be left; otherwise, at the next picking they will be too soft to ship. One soft berry in a basket may spoil the entire contents, and one spoiled basket of berries may spoil the looks of a crate by the time it reaches the market. In picking, the stem should be pinched off, leaving about a half inch attached to the berry. Each berry should be placed carefully (not thrown or dropped) in the basket. Baskets of berries should never be left in the sun, but should be taken to the packing shed or placed in the shade as soon as possible.

Carriers holding six 1-quart baskets are used in picking in most sections of this region. Two types of carriers in common use are

shown in figures 10 and 11. Figure 10 also shows the style of crate which is almost universally used. It holds twenty-four 1-quart baskets and is not usually returned to the grower when emptied. Figure 11 shows also a good type of packing house.

VARIETIES.

In selecting a variety for shipping to northern markets it is best to choose the most popular variety grown in the section where one desires to raise strawberries. Such a variety will be known in the large markets, and buyers will usually pay more for it than for an unknown sort. In selecting a variety for a local market it is usually best to follow the same practice. Special markets for special sorts, however, may be developed and varieties other than those usually grown may be selected.

The varieties of commercial importance in 1917 in the States of Tennessee, Kentucky, and West Virginia are the Klondike, Aroma, Gandy, Thompson, Excelsior, Dunlap, and Bubach. Others are grown, but only in a limited way for local markets or for testing in comparison with standard varieties. Among the varieties under trial or grown to a limited extent are the Sample, Ozark, Warfield, Texas, St. Louis, Missionary, Parson, Corneille, and Champ Clark.

In west Tennessee more than 90 per cent of the acreage is of the Klondike variety. Most of the remaining 10 per cent is of the Gandy variety, though in the northern part of west Tennessee this variety forms more than 10 per cent, while in the southern part the Klondike forms fully 99 per cent of the total acreage.

About Nashville, Tenn., the Gandy is the principal shipping variety. For the local markets many varieties are grown, including the Haverland, Champ Clark, Michel, Bubach, and others.

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FIG. 11.—A shed at Bowling Green, Ky., used for packing strawberries. Note the different types of carriers in use.

About 80 per cent of the total acreage around Knoxville, in east Tennessee, is of the Aroma variety. This percentage decreases as one goes south, until about Chattanooga the acreage of the Aroma is 20 to 30 per cent of the total. On the other hand, the Klondike comprises about 10 per cent of the acreage in the neighborhood of Knoxville and increases to the south until at Chattanooga it forms about 60 per cent of the acreage.

In east Tennesee as a whole the Aroma is the most popular strawberry and the percentage of this variety is increasing, while that of the Klondike is rapidly decreasing. The Gandy forms only a small part of the acreage in this section and is not likely to be planted largely.

In the Bowling Green section of Kentucky about 90 per cent of the crop is the Aroma and the remaining 10 per cent the Gandy and Klondike. In the Louisville section about 80 per cent of the shipments are the Aroma and 20 per cent the Gandy. For the local market, besides the Aroma and Gandy, the Haverland, Bubach, and Dunlap are liked. In the remainder of Kentucky the Aroma is the leading variety, while the Gandy is grown to some extent.

In West Virginia the Gandy, Haverland, Aroma, and Dunlap, besides many other varieties, are raised.

SUMMARY.

Two methods of strawberry culture are in common use in Tennessee, Kentucky, and West Virginia, the intensive and extensive. The intensive method has been adopted by farmers and is the best for use in these States.

In selecting a location for a strawberry plantation in the States mentioned, a place having good roads to a suitable market or to a railroad point having good transportation facilities should be chosen.

In selecting a site for a strawberry plantation the most important factors to consider are the supply of humus in the soil and the slope of the field. A good site has a gradual, smooth slope and a soil which contains a good supply of humus.

The field to be planted should have been in a cultivated crop for two years before being set to strawberries in order to free the ground of white grubs and weed seeds. Newly cleared land, however, may be planted immediately after it is cleared.

To supply humus, either a green-manure crop should be plowed under the year before the plants are set, or the preceding crop should be fertilized with a liberal application of stable manure.

In hilly sections the plant rows should follow the contour of the field, in order to prevent the washing of the soil.

Acid phosphate is the only fertilizer commonly needed, and growers should apply it or steamed bone meal at the rate of 200 to 800 pounds per acre to small plats and compare the yields with those of an unfertilized plat in order to determine just how much will be profitable under their conditions. Stable manure should not be applied ordinarily except to crops preceding strawberries.

The plants should be set early in the spring at intervals of about 18 inches in rows 3½ feet apart. The blossoms should be picked off during the first year if there is any danger of failing to secure a good stand of plants.

The matted-row system is best adapted to conditions in the region covered by this bulletin. The rows should be 18 to 20 inches wide except on hillsides, where they should be somewhat wider.

A straw mulch should be used to conserve moisture during the fruiting season and to keep the fruit clean. When the plantation is renewed the plants should be thinned and the field cultivated, the same as during the first year.

In selecting varieties for any locality, those which are most popular in the vicinity should usually be chosen. At the present time the Klondike is grown extensively in all parts of Tennessee and is the most popular variety in the southern part of that State. The Aroma is liked in the northern part of east Tennessee, and its popularity is increasing in all of east Tennessee. About Nashville, Tenn., and in the northern part of west Tennessee, the Gandy is popular. About Bowling Green and Louisville, Ky., the Aroma is liked best, although on heavy clay soils the Gandy is considered more desirable. In the remainder of Kentucky and in West Virginia the Gandy, Aroma, Dunlap, and other varieties are grown.

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